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MAP
OF
THE RIVER CONGO
WITH MEMORANDUM
BY
The Rev. George Grenfell

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JUN 6 1910

THE UPPER CONGO AS A WATERWAY.

By the Rev. George Grenfell, B.M.S.

NOTES TO ACCOMPANY THE AUTHOR'S MAP OF THE RIVER CONGO.

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(*From 'The Geographical Journal' for November*, 1902.)

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THE UPPER CONGO AS A WATERWAY.

By the Rev. George Grenfell, B.M.S.

(*From 'The Geographical Journal' for November.*)

Until a quarter of a century ago people little dreamed of the existence of the great Central African waterway which now furnishes a practicable route half across the continent; and when Mr. Stanley (now Sir Henry M. Stanley) discovered this magnificent natural canal of 1000 miles in length, he little thought that the affluents flowing into it from the north and from the east and from the south would increase the available waterway to beyond 6000 miles. Neither could he, nor those who were so interested in his great discovery, have ventured to imagine that by the end of the century that had already entered upon its last quarter, more than a hundred steamers would have been launched upon those waters in the interests of commerce and civilization.

The cataracts that bar the navigation of the Congo at a point 100 miles up-stream from the coast, and that are more or less continuous for some 200 miles, have sufficed from the days of Diogo Cão right down to our own times, to daunt every explorer who from the Atlantic has tried to solve the mystery of the upper river, and it was only to the intrepid traveller from the Indian ocean that it at length yielded up its secret. Even the navigable lower river, accessible though it was from the sea, was but little known, and was practically unused as a route to the interior, the greater portion of the upper Congo trade finding its way to the coast by the long overland route to Loango, Ambriz, and St. Paul de Loanda. So late as 1874, when Lieut. Grandy started eastward in search of Dr. Livingstone, he left the coast at a point some distance south of the mouth of the river, and struck away inland without utilizing the waterway.

Till 1879, two years after Stanley's discovery was made known, steamers rarely made their way up the lower Congo beyond Boma, and then, with the exception of a small gunboat at long intervals, these

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were all coasters of but light tonnage. In fact, sometimes for periods of three months together, Boma would be entirely dependent upon canoes and small sailing craft for its communication with the coast. In no case, however, did these small steamers go beyond Noki; but to-day it is by no means unusual to see four ocean liners, ranging up to five thousand tons, at Matadi, the port at the foot of the cataracts whence the railway sets out on its track to Stanley pool, and after some 220 miles reaches the smooth water of the upper river. Matadi is at the farthest limit of navigation on the lower river, some 8 miles beyond Noki, and, instead of being the bare rock it was a few years ago, is now, after much blasting, the site of one of the most important ports on the west coast of Africa.

At the other end of the railway, where, after rounding the cataracts, it reaches the navigable upper river, is the port of Leopoldville, the next most important place in the Congo State to the capital at Boma. Brazzaville, the administrative centre of the French on the upper Congo, is on the other side of the river about 3 miles away. These places were unknown native villages twenty-five years ago, but since that time have witnessed great developments, and have become the starting-points for a fleet of more than a hundred steamers that have been carried in plates and sections beyond the cataracts, and reconstructed there. These steamers are of all sizes, from small open launches up to crafts carrying between 200 and 300 tons.

Steamers on the Upper Congo.

The first steamer to reach the great Central African waterway was the *En Avant*, a small paddle-boat 43 feet long and 8 feet in the beam. It was carried up in three sections on waggons, and reached Leopoldville in November, 1881, after a couple of years of very arduous labour on the part of Mr. Stanley and his lieutenant, and the continuous employment of several hundred carriers and workmen.

The next steamer to arrive came a year later. It was a 30-feet mahogany launch, and was carried up on a single waggon. It had seen service as a tender to one of King Leopold's yachts, and was placed at Mr. Stanley's service by his Majesty—a beautiful little craft, but one that proved too frail for the trying conditions of upper Congo service.

This was followed by the French steamer *Ballay*, a steel launch larger than the mahogany one just referred to, but smaller than the *En Avant*. It was brought by way of the Ogowe, and after steaming as far as possible up that river, its boilers and engines were dismounted, and its empty hull hauled through the shallower waters of the upper reaches. Later, when it could be no longer borne by the waters of the Ogowe, it was dragged across the narrow watershed dividing that river from the Alima. The waters of the Alima being reached, the hull was

refloated, and, deeper water being gained, the machinery was replaced, enabling her, under steam, to reach the main stream of the Congo at a point some 250 miles above the cataracts, and about 550 miles from the coast.

The labour involved in the transport of each of these three steamers was so great, that when the fourth was decided upon, it was arranged to send out the prepared materials, plates, and parts of machinery, and to put them together at Stanley pool, where the upper navigable river commences. The experiment was an eminently successful one, and it was proved that a great deal more was gained by transporting a steamer in small pieces, such as could be carried on men's shoulders, than was involved by the cost of reconstruction. This steamer, the *Association Internationale Africaine* (named after the organization under whose auspices it was sent out), was about the size of the *En Avant*, but had a screw propeller instead of paddles; it was completed early in 1883.

The next boat to be launched on the Congo was the *Peace*, sent out by the Baptist Missionary Society of Great Britain. Designs were prepared for her early in 1882, but it was not till December that she was ready for shipment. Transport and reconstruction occupied just a year and a half, and allowed of her being launched in June of 1884. In this case the idea of subdivision was carried out so thoroughly by Messrs. Thornycroft, the builders, that no single piece of the hull, or boiler, or machinery was of greater weight than the tusks of ivory the native carriers were accustomed to carry from the interior down to the coast. She was a twin screw boat, 70 feet long and 10 feet 6 inches wide, drawing only a foot of water, and was the first craft to which the since famous Thornycroft tubulous boiler was fitted. She is still running, and rendering very efficient service.

During the first two years after being launched she carried those in charge of her along 2000 miles of the upper Congo affluents, previously unvisited by any white man, and it was during this time that the preliminary lines of the map of the main stream now published were laid down. The details of the islands, and of the many channels, have since been filled in as opportunity has offered during a succession of journeys up and down river.

While the *Peace* was being reconstructed at Stanley Pool, the Belgian Association was engaged in the task of transporting the first stern-wheel steamer, *Le Stanley*, to the upper river. She was a boat 80 feet long by 16 feet beam, built by Yarrow on their widely adopted system of floatable sections, a system that allows of the structure being bolted together as its various sections float on the surface of the water, and the steamer to be completed without the help of a slipway or a dock. The separate sections of this craft were 16 feet by 10 feet by 4 feet deep, and each one had its own iron-wheeled waggon. The

difficulties encountered in hauling these waggons over the hills were so great that, although during the following fourteen years some forty more steamers were carried round the cataracts, this system was not again resorted to till the railway made the transport of heavy sections a simple matter. Only one departure from the plan of sending up prepared and fitted plates was resorted to, and this was in the case of the *Ville de Bruxelles*, a pitchpine boat, 80 feet by 18 feet, which was sent up in the shape of planks and timbers. In this case the cost of transport was also very heavy, and the durability of wood proved to be so far inferior to that of steel plates as hardly to enter into competition therewith. The experience gained in the case of the mahogany boat, and later with this pitchpine one, was clearly against building with wood. By this time, also, experience was just as clearly in favour of stern-wheels as propellers. Stern-wheels, however, are heavy, and involve heavy machinery difficult and costly to transport, and only the Government and the larger commercial enterprises could face the problem of organizing the needful caravans for anything but a comparatively small boat of this type. The Congo Inland Mission managed to get their 70-feet boat through in 1884; but one of the American missions, after spending a considerable sum in carrying a larger boat part of the way round the cataracts, had to abandon the task, and to pay a further considerable sum to have it carried back to the foot of the cataracts. Here this boat was eventually reconstructed and sold, and it has since remained on the lower river.

Since the completion of the railway in 1898, the upper Congo fleet has been more than doubled in number, and has been increased to several times its previous capacity. Till the railway provided for the transport of heavy machinery, steamers were practically limited to a maximum capacity of 60 tons. With the help of the railway, steamers of 200 to 300 tons have been launched at Leopoldville, and this without a tithe of the effort and stress previously involved by the transport of a steamer one-fifth the size.

The stern-wheel system has simplicity and ready access to machinery as prominent advantages, though it is not so economical as the ordinary screw-propeller. The smaller boats are also inclined to be top-heavy, and small and large alike have as little of the "ship-shape" about them as any floating craft can well possess—a 2-lb. biscuit tin with a long funnel at one end and a sort of water-wheel at the other would make a model doing but little injustice to the majority of Congo stern-wheelers.

The Government is trying experiments with a series of lighters of from 70 to 300 tons, and powerful tug-boats capable of towing them at moderate speed; but up to the present opinion is somewhat divided as to the advantages of the system. Theoretically there is much in favour of it, but the difficulties of navigation caused by currents and

counter-currents of the narrower reaches of the river are greatly increased when the power and the load are in separate vessels.

The reconstruction of steamers and boats sent out in comparatively large sections, as so many have been since the completion of the railway, is a much simpler task than when plates have to be riveted together one by one, and the structure gradually built up. It has the disadvantage, however, of involving much heavier cost for ocean freight, and of not being so strong, for the joints between the sections are continuous lines from keel to deck, across the deck, and down to the keel again, whereas in the case of plates the joints are "lapped" like those in the boarding of a well-laid floor. The disadvantage in this latter respect was strongly emphasized last year during a trial trip by the giving way of one of these long lines of joints, and the termination of the steamer's career. As I came down river last time I saw her upper works just above water, some 2 miles or so out of the dock where she had been put together.

Considering the many risks encountered by steamers on the upper Congo and its affluents, the list of total losses is not so great as one might expect. The losses would have been much greater but for the careful way in which most of the boats are subdivided into watertight compartments. These subdivisions are not only important as confining the area to which water is admitted in case of a plate being "stove in," but because they greatly stiffen the long shallow hulls, and enable them to stand the severe and variable stresses consequent upon the unequal distribution of load on the structure generally. These "stresses" in the case of stern-wheelers are peculiarly severe, seeing the heavy boiler is at one end and the machinery at the other, and just where, in each case, the buoyancy is least. To counteract the tendency in these boats to rise amidship and to drop at the bow and stern, posts and tie-rods are introduced in all but the smaller ones; but notwithstanding these measures, it is very unusual to see a stern-wheel steamer that preserves her original lines for more than the first few months of service. However, though many of the Congo steamers are only built of very light plate and become more or less hump-backed, they are so tied and braced together that they carry their heavy loads wonderfully well. It is no unusual thing to see them laden till they have less than a foot of freeboard, and, in places where the river is rough, to see the water rolling pretty continuously across the decks. Where hatches are well fastened down this is not a very serious contingency perhaps, but, caught in bad places, two 10-ton boats with large deck-openings filled and went down in deep water. Two other steamers of nearly the same size have also been totally lost by having been carried over cataracts. The strong currents setting off projecting reefs, and the counter-currents and whirlpools forming below them, have been responsible for the loss of two 20-ton stern-wheelers. This class of boat, if it carries any

considerable structure on the awning above the main deck, is peculiarly liable to top-heaviness. In both the cases now referred to the steamers capsized, and, after floating down stream a short distance, finally disappeared in deep water.

Dangers of Navigation.

Long reefs of rocks jutting out into the stream, and sometimes occurring as isolated patches in the middle of the river, render the first 150 miles or so of the upper Congo beyond Leopoldville particularly dangerous. They have so far, however, caused but two total losses, though they have involved very heavy expenditure for repairs to many boats. Reefs jutting out from the bank are generally indicated by their shoreward ends presenting themselves to view, and by the ripple they cause upon the surface of the water; but isolated reefs and rocks are sometimes found in the quiet places below projecting points, where there is no current at all, or perhaps a slight counter-current, and these are the most dangerous of all the obstacles to Congo navigation. A 40-ton steamer was wrecked on one of these projecting reefs, but her cargo and much of her machinery was saved; and the *Courbet*, sister craft of the *Faidherbe* that was carried across the watershed dividing the Congo from the Nile to figure in the "Fashoda affair," was lost by striking one of these isolated masses of rock in comparatively still water. She struck it with sufficient force to tear open several plates and to pass over into deep water beyond, where, some four or five minutes later, she sank, as the *Victoria* sank, bow first, and her propeller still revolving in the air as her stern disappeared from view.

Next to the rocks in importance among the dangers of Congo navigation one must rank the "snags." They cause as many accidents as the rocks, but happily not such serious ones. As the Congo and its affluents with their more than four thousand islands furnish at least 20,000 miles of overhanging wooded banks, the number of trees which fall annually into the water is very considerable. Many of these are of greater specific gravity than water, and lie just where they fall; the lighter ones float for awhile, but becoming waterlogged they sink to the bottom. Those that sink in deep water are no menace, but those that lie where during the fall of the river they come within a few feet of the surface are a constant source of danger.

Steamers drawing more than 3 feet of water incur greatly increased risks, because snags and rocks below that depth give little or no evidence on the surface of their existence below. During the low-water season steamers drawing more than 4 feet of water are navigated with considerable difficulty, by reason of the innumerable sandbanks which encumber the channels. This is especially the case on downward journeys, much time being frequently lost in pushing or in warping off. If the steamer draws 3 feet or so, the crew can generally

solve the difficulty in a little while by jumping into the water and pushing in the required direction, two or three of them being occupied the meanwhile in searching for deeper water, and, having found it, they form into a line of living buoys, indicating the best route across a shallow patch. If mere pushing is not enough, the anchors of shallow boats can easily be carried out into 4 or 5 feet of water and the winch be brought into requisition for the work of warping off. But when the boat draws 4 feet or more, anchors have to be carried out by means of boats or canoes, and warping off becomes an especially wearisome operation. Stern-wheelers can cope much more speedily with the difficulties furnished by sandbanks than is the case with screw-propellers. If a stern-wheeler sits down on a sandbank, it is mostly a matter of keeping the engines going astern for a time, and the violent wash caused by the paddles will excavate a channel; the screw-propeller, on the other hand, simply excavates a deep hole immediately under the stern, while at the same time it drives a lot of sand into the stern tube bushings, and grinds the shaft and bearings away in a fashion that is simply terrible from the engineers' point of view.

The reason why down-stream journeys are more seriously delayed by sandbanks than those in the opposite direction is due to the fact that the banks gradually shelve upwards till their highest ridges are reached at the down-stream ends, and steamers, after being driven up the sloping bank a certain distance by virtue of their own speed, are driven on still further by the force of the descending current. On the other hand, a steamer going up-stream strikes a sandbank with its own proper force reduced by that of the current instead of increased thereby, and, as a sandbank generally presents a steep face on its down-stream side, the steamer either cuts through the crest or is pulled up sharp before it is seriously embedded.

Upon regarding a map of the Congo between the 15th and 25th meridians, one remarks that the river follows a course indicated by wide curves and comparatively right lines that contrast very markedly with the serpentine courses of so many rivers. However, if the banks of the river are not traced in the characteristic sharp curves of inland waters, the main volume of the river and the strong currents undoubtedly follow very sinuous lines. Where the river-banks are comparatively close, say from $\frac{3}{4}$ mile to $1\frac{1}{2}$ mile apart, the water setting over from one side to the other creates below the point of deflection a counter-current, where banks of sand and mud are deposited, and, upon impinging upon the other side, the water is again deflected and another counter-current set up, to be followed by the formation of other banks. Thus the course of the main volume of water is very tortuous, though, except at very low water, when the banks show above the surface, the fact is apparent only to those who are personally interested in navigating its course. Where the river

widens out, as it does in many places, to more than 5 miles, and even to 6 or 7, and where it winds its way among islands and round sandbanks, the waters, instead of maintaining themselves at a depth of several fathoms, are reduced to as many feet or even less. Spread over so wide an area, they become sluggish, and much of the sand with which they have been charged, picked up in the higher reaches by the swifter stream, is deposited in the shape of a long series of fan-tail banks, over the extended edges of which the water glides with its very characteristic ripple into the suddenly deepened channel on the down-stream side, and this, in many cases, without affording a passage for even a shallow-draught steamer. If such a bank is to be passed at all, it is at the extremity on the opposite side from which its formation commenced, but very often the deeper water to be looked for between the point of the sandbank and the shore is so narrow or is so overhung by trees as to be impracticable, and then another channel has to be sought among the islands. As there are nearly eighty islands between 5 and 10 miles in length, and fifty more than 10 miles (one is nearly 50 and two are more than 30 miles long), getting out of one channel into another is sometimes a serious contingency involving a long *détour*.

Navigation of the Congo.

The navigable upper Congo commences at Leopoldville, situated at the head of the cataracts, and at the point where the railway round the cataracts has its terminus. From Leopoldville to Stanleyville, at the foot of the Stanley falls, a distance of 980 miles, navigation is uninterrupted all the year round. The government wharf and the railway terminus are within 200 or 300 yards of the ledge of rocks over which the river makes the first of a long series of drops on its way to Matadi, a series with a total of 700 feet.

On leaving Leopoldville and proceeding up-stream, one has the French Congo on the left hand for a distance of 330 miles, as far as the confluence of the Mobangi, along the course of which stream the boundary turns northward. From this point the Congo Independent State holds both banks of the main stream.

Brazzaville, the capital of the French Congo, is about 4 miles beyond Leopoldville and the cataracts, and, of course, is on the other side of the river. The entrance to Stanley pool is about 3 miles beyond Leopoldville, and the river thus far is from 1 to $1\frac{1}{4}$ mile in width. On the Brazzaville side the cliffs are 100 feet or more in height; on the Congo state side the banks are not so bold, but are even more rocky. As, besides the rocks on either side, there are several detached reefs right out in the stream, navigation is very dangerous—so dangerous, in fact, that from time to time the question of making a new port some 6 or 7 miles beyond has been seriously entertained. At Kalina point the full

force of the Congo is encountered, and rounding it into Stanley pool is often a difficult matter. The downward current, as it rushes out of the pool, sets off the point with such force as to make a strong up-current for a quarter of a mile below on the landward side. Taking advantage of this current on going up-stream is always fraught with the risk of being swept completely round as one enters the down current, unless the matter is negotiated in the most careful manner. Captains always breathe more freely when Kalina point is behind them.

Stanley pool is an expanse of water and islands and sandbanks some 20 miles in length by 14 miles in breadth, but though Kalina point has been passed on entering it, the difficulties of navigation are not at an end; the south-west corner of the pool bristles with rocks till Kinshasha is well astern. Then, as soon as the rocks are passed, one is in the midst of the difficulties furnished by the sandbanks deposited by the river as it spreads itself out and becomes too sluggish to hold the sand any longer in suspension. The difficulties presented by sandbanks would not be so great if, like the rocks, they but stayed in the places where one found them. The channel of this season may be dry bank the next, and soon be covered with grass and scrub, but only perhaps to disappear a little later at the rate of some hundreds of cubic yards per minute as it is undermined by the current, which has once more been deflected towards its previous course. Sometimes a disappearing sandbank, while it goes to build up an obstacle at some other point, leaves a positive danger in the shape of a reef of rocks which it had previously very effectively masked.

Beyond the pool the channel for 125 miles is confined between steep-faced hills on either side. From bank to bank the distance ranges from 1 to 2 miles; it is frequently less than 1 mile, very seldom as much as 2. The hills rise to 800 feet above the river for some distance from the pool, but at 100 miles beyond they are seldom much more than half that height, are much less steep, and begin to recede from the water's edge. The height of the river above the sea is a little more than 800 feet. For the first 30 miles the course is eastward; then, after passing the Black river, it turns sharply to the north. At a point 85 miles beyond the pool the Kasai joins the Congo, pouring its immense volume into it at a right angle through a deeply cut chasm in the rocky hills some 700 yards in width. Through this gap in the hills steamers have access to the series of waterways furnished by the Kasai and its tributaries, amounting to not less than 1500 miles. When the Kasai is in flood its current in the centre is from 5 to 6 miles an hour, and it brings down such an amount of bright brick-red water as to greatly modify the dark brown of the stream which gradually absorbs it.

About 40 miles north of Kwa mouth (the Kasai confluence), the "Chenal," as it is called, terminates; the hills have so receded that the river spreads itself out to a width of 5 miles, the rocky ledges and reefs,

the spurs sent out into the river by the hills on both sides, and that have been a continual menace since leaving the pool, have given place to sandbanks, and rocks are hardly seen again for 500 miles. This expansion continues northwards for 30 miles; it is very shallow, and its farther end is characterized by many islands. On the slightly rising ground at its northern extremity, the Bolobo villages are found, and just beyond, after narrowing to less than 2 miles, the channel expands again to a width of 5 or 6 miles—the width it practically maintains as far as Lukolela, a distance of 100 miles. Midway along this reach the Alima pours its water into the Congo from the west, and the delta it forms extends itself into the main stream till the width becomes a little less than 4 miles. It is at this point alone, throughout the length of this reach, that both banks of the river are in sight of each other, the long lines of islands elsewhere obscuring the view. On the same side of the river, and some 30 miles beyond the Alima, is the principal mouth of the Sanga, a very important tributary that furnishes an available waterway for steamers right up to the south-eastern corner of the German Cameroons colony.

The Lukolela narrows are some 5 miles in length, and are formed by a range of low hills of ferruginous conglomerate, running north and south, through which the river makes its way. Twenty miles beyond, and after widening out again to 5 miles, there are more narrows and more ferruginous conglomerate, though it does not rise more than 30 or 40 feet above the river. Beyond the Butunu narrows, the river widens to 7 miles, but in less than 25 miles the conglomerate upon which Liranga and Ngombe are built reduce the river once more to less than a couple of miles. Liranga is at the south-western limit of the delta formed by the confluence of the Mobangi with the main stream, and from this point the French boundary trends northwards, following the "thalweg" of the Mobangi instead of that of the Congo. The Mobangi is navigable as far as Zongo, a distance of 350 miles, and there are several important reaches beyond that are available for the small steamers taken beyond the various rocky barriers at propitious moments of the river's flood. It was by this river and its affluent the Mbomu that the *Faidherbe* made its way, to be eventually carried across into the Bahr el Ghazal province. It is by this river, also, that the French expeditions towards Lake Chad find their most advantageous route from the south.

Beyond the Liranga-Ngombe narrows there are 170 miles of the Congo's course before, at a point just below Bangala, it is reduced to 2½ miles from bank to bank. So persistently do the islands block the view, that throughout the whole length of this long reach there are very few places where one bank is observable from the other. The Juapa, the Ikelemba, and the Lulongo rivers pour their inky waters into this reach within the first 40 miles north of the equator, and, after

commingling with the Congo, very perceptibly darkens its hue. These important eastern tributaries furnish more than 1000 miles of navigable waterway, but they mostly traverse very low-lying country.

Between the Bangala narrows and Bopoto, where once more the river is perceptibly reduced in width, there is a distance of 175 miles. Where this reach includes the 50-mile island of Nsumba, the river widens to 9 miles. The only important tributary received in this reach is the Mongala, from the north-east, a river navigable for more than 300 miles, and traversing one of the best rubber-producing fields of the Congo State. Bopoto is situated almost at the extreme north of the great "Horseshoe bend" (in 2° 7' N. lat.), and on the flank of the first semblance of a hill for more than 400 miles after passing Lukolela. After so long a stretch of low flat land, it is quite refreshing to see a hill, even though it is barely 200 feet in height; to the natives who have not previously seen anything bigger than an anthill, such an altitude is quite impressive, and to the younger people even awe-inspiring. Here one comes into contact with the felspathic bed rock of the central part of the continent, and for 10 miles or so navigation becomes a very serious matter because of the dangers incident upon the presence of reefs. It is the same rock over which the Congo drops at Stanley falls, and over which it drops again below Stanley pool.

The next narrows are 100 miles beyond Bopoto, and about 10 miles above the mouth of the Loika, or Itimbiri river; apparently they are caused by the deposits brought down by that river. The Loika is navigable by steamers for 150 miles, as far as the Lubi falls, and is the route by which the Congo Government transport leave the Congo for the Lado enclave on the Nile.

At a distance of 105 miles beyond the Lubi narrows, and just beyond the mouth of the Aruwimi, the Congo is reduced to a mile in width, and beyond that point largely loses its lacustrine characteristics. A change announces itself on the southern bank some 30 miles before reaching Basoko (the centre of administration at the mouth of the Aruwimi river), by the reappearance of rocks and of low hills, and by the time one is opposite Basoko the hills have become pretty continuous, and rise to nearly 200 feet in height. On the north bank, the high land does not commence till one is 15 miles east of the Aruwimi, beyond that point it is nearly continuous till Stanley falls are reached. On the southern bank, however, the hills soon give place to a narrow ridge of clay and gravel bank slightly above flood-level, with a wide extent of swampy land to the interior. The distance between Basoko and Stanley falls is 130 miles, but at a point a little less than halfway, the Lomami, coming from the south, empties into the Congo the waters it has gathered along a course of more than 700 miles; it is navigable for more than 200 miles. If the Congo is markedly less in size above the Aruwimi, it is even more markedly reduced beyond the point where it receives the

Lomami, and the islands become very few. At 20 miles beyond the Lomami the channel is once more bounded by steep and often rocky banks of from half a mile to a mile apart. During the low-water season the navigation of the last 20 miles below Stanleyville becomes somewhat dangerous, because of the reefs of rocks that at that time lie so close to the surface. Boats drawing more than 3 feet of water find this part of the river impracticable during the dead low water that sometimes obtains at the autumnal equinox, but happily this only lasts for a week or two, and at all other times boats drawing from 4 to 4½ feet can, with caution, navigate the whole of the 980 miles from the pool to the falls.

Flood Seasons.

On the upper Congo each year is characterized by two flood seasons, May and November, prolonged respectively in some places till June and December. The maximum rise in the upper reaches towards Stanley falls is about 8 feet at both these dates. At Stanley pool the rise in May is not so great, but in November and December it is nearly twice as much.

In January and February the water is falling everywhere over the Congo system. The Mobangi has commenced to fall in October, and by this time is near its minimum. At Stanleyville the water commences to fall early in December, but at Stanley pool the maximum is at times not reached till the close of the month. During the month of January the fall is very rapid, and by the end of the month the river is very low. In April there is a very general rise, and the Loika and the Aruwimi approach their high-water marks. By May the Congo waters are so much higher than those of the Mobangi that there is a flow of Congo water into the Mobangi through the Ibenga channel and flowing northwards to 24′ 30″ south of the equator. The same thing occurs in the Ekenzi and Bwaiya channels communicating with the Sanga; they serve, according to the relative heights of the waters of the Sanga and the Congo, as outlets or inlets.

As there are two high-water seasons, so also are there two seasons of low water, the second occurring in August and September; and at some points these are the months of the lowest water of all the year. Along the farther half of the upper river the rising and falling of the water is more capricious than further down stream, changes of 2 or 3 feet occurring in a day or so without persisting. At Bolobo and the pool the rising and falling are most regular; the rise seldom exceeds 2 inches per day, and the fall is rarely more than 3 inches in a similar period. This greater regularity is doubtless due to the fact that the inundated plains, thousands of square miles in extent, which are under water every season, act as storage reservoirs, as Lake Ntumba also does, alternately taking and giving the water as the river rises and falls.

Velocity of Current.

The rate at which the Congo current flows varies very considerably; it seems to depend somewhat upon the height of the river, and to be modified also by the contour of the channel. Generally speaking, the current is faster as one approaches the higher reaches. The fastest currents registered, except at points where exceptionally accelerated, have been in the neighbourhood of Basoko and beyond, and they have ranged from 300 to 350 feet per minute. Near Bopoto, according to season and location, the current ranges from 225 to 270 feet per minute; lower down river the mean may be taken as 200 feet per minute. Some of the affluents flow at a slower rate, and range from a speed of from 70 to 170 feet. At the point where the Kasai pours through its narrowed channel into the Congo, the current is not less than from 600 to 700 feet per minute at the time of flood—about the same rate as that of the Congo itself as it flows out of the pool round Kalina point.

Fuel for Steamers.

Seeing that railway freight round the cataracts is nearly £40 (forty pounds) per ton, the importation of coal as fuel for steamers is practically impossible. Fortunately, lack of wood, which so hampers steam navigation on the Nile, is unknown on the Congo, as, in the main, the banks of the river and the islands are forested throughout the whole course from Leopoldville to Stanleyville. True, in some reaches there are stretches of grassy foreshore before the forest is accessible, and in some places the forest is very swampy, but it is very seldom indeed that wood is not within reach. Sometimes during the high-water season it has been needful for wood-cutters to work in 2 or 3 feet of water, and even, in places where no foothold could be secured, for them to go out in boats so that they might reach and climb the trees for the purpose of lopping off their branches, after having made fast the ropes by which they were to be drawn on board the steamer for fuel. The increased consumption of wood, by reason of the recent additions to the upper Congo fleet, has made dry wood scarce in some places, but as yet very little cutting of live timber has been needful to keep up the requisite supply of fuel, and the forests are so prolific that even though they had to be thinned out to meet the supply, the thinning could be so arranged as to be of advantage to the timber growth rather than otherwise. So far the dead trees of the forest have met nearly all the demands, and the annual supply of such fuel is immense.

Food Supplies.

The matter of food-supply is not less important than that of fuel. The difficulty in obtaining food from the natives is hardly credible to those who regard the Congo banks as populous and fertile; if they were

more populous they could easily be made productive. As things are at present, steamers going down to the Pool have to shorten their stay to the fewest possible days on account of the difficulty experienced in feeding their crews, and after leaving the Pool, nothing or next to nothing is to be obtained for the first 180 miles. The great lack is that of people to cultivate the ground. After carefully counting the houses in the villages on the banks of the river, and allowing a very full average for the inhabitants of each house, it is perfectly clear that there are not more than 125,000 people in the villages and towns along the 980 miles of waterway. The great necessity of the Congo, as of all African colonies, is people for its development. We know there are many places in the Congo State where the population is much more dense than on the river-banks, but nowhere else are people of such advantage to the Government or to commerce as they would be if settled on the banks of the great central waterway of the continent. A policy which made the river-banks to be more desired by the people than the interior, would best serve the interests of the State, and would help forward at a greatly quickened pace the opening up and civilization of the country.

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A MAP OF THE
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BETWEEN
LEOPOLDVILLE AND STANLEY FALLS,
From Running Surveys in the Steamers "PEACE" and "GOODWILL" by the
Rev. GEORGE GRENFELL, B.M.S.
1884-89.
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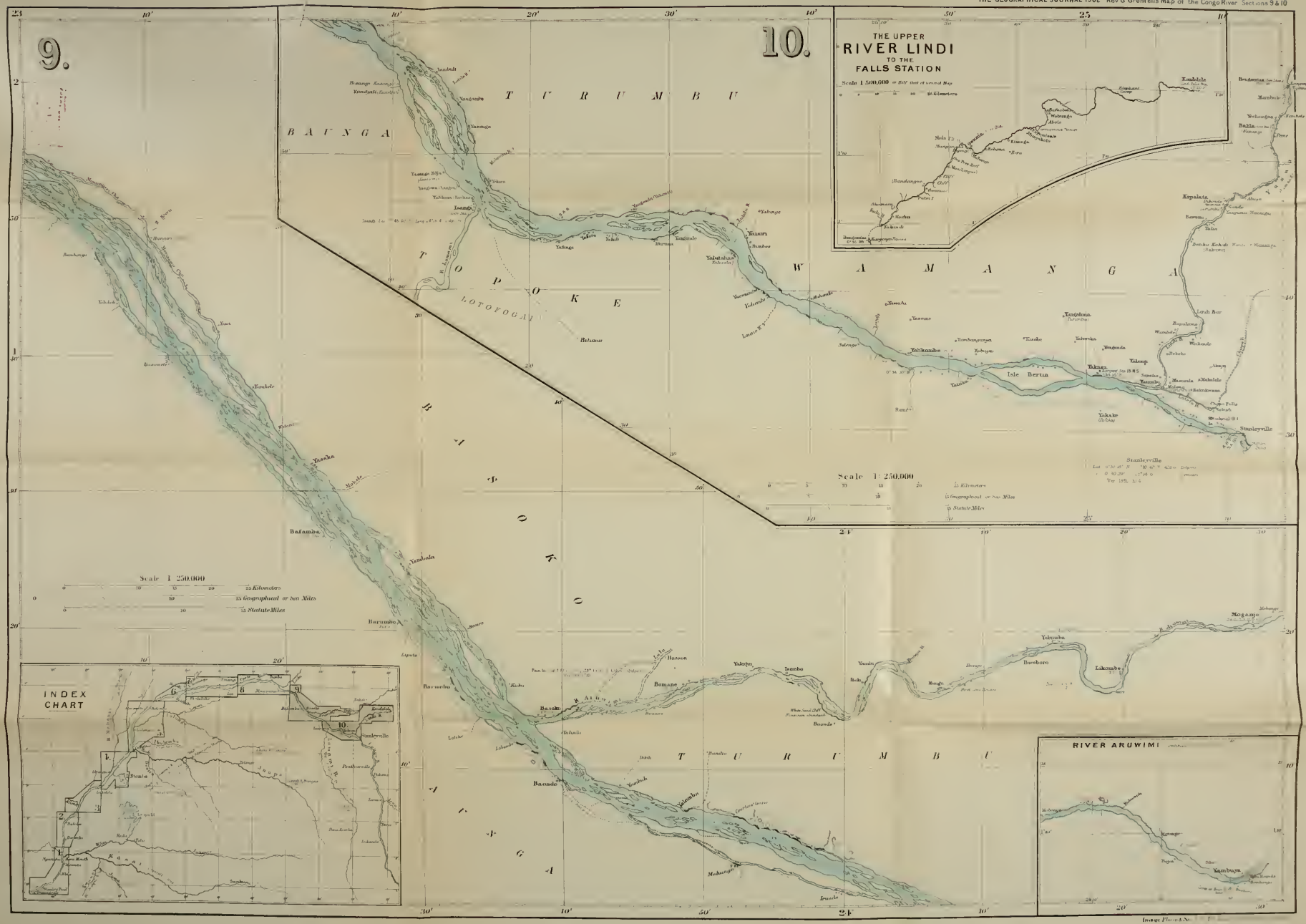

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